Notice of Allowability	Application No.	Applicant(s)	
	09/684,488	ZHANG ET AL.	
	Examiner	Art Unit	
	Monplaisir G Hamilton	2135	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the amendment filed on 7/12/2004*.

2. ☒ The allowed claim(s) is/are *21, 23-27, 29-34, 36-37, 39-49*.

3. ☒ The drawings filed on *04 October 2000* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date *9/21/04* .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Kim Vu
SUPERVISORY PATENT
TECHNOLOGY CENTER

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/12/2004 has been entered.

EXAMINER'S AMENDMENT

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mark E. Scott, Reg. No. 43,100 on 9/21/04.

The application has been amended as follows:

21. (Currently Amended) A system for clustering data comprising:
a computer executing a computer program performing at least the following:
receiving into the computer a plurality of data points for clustering;
receiving into the computer a size parameter for specifying the number of data points to be simultaneously evaluated for inclusion in a cluster;

clustering the data points by using the size parameter to generate clustered results by evaluating subsets of data points in each cluster for moving into every other cluster by using a predetermined metric, wherein the number of data points in a subset is specified by the size parameter;

determining whether the clustered results are satisfactory;

when the clustered results are satisfactory, stop clustering;

otherwise when the clustered results are not satisfactory, revise the size parameter, perform clustering based on the revised size parameter and the clustered results, and proceed to determining whether the clustered results are satisfactory.

22. (Cancelled)

23. (Currently Amended) The system as defined in claim ~~22~~ 21 wherein evaluating subsets further comprises:

determining a geometric center of the subset of data points being evaluated for a move;

using the geometric center of the subset of data points and the predetermined metric to generate a value.

24. (Previously presented) The system as defined in claim 23 wherein evaluating subsets further comprises:

determining whether the value is greater than zero;

when the value is greater than zero, moving the subset of data points from a Move_From cluster to a Move_To cluster;

when the value is not greater than zero, determining if there are more subsets to evaluate;

when there are more subsets to evaluate, proceeding to evaluating the subsets;

when there are no more subsets to evaluate, determining whether any point has moved;

when a point has moved, proceeding to evaluating the subsets; and

when no point has moved, stopping the processing.

25. (Previously presented) A system for clustering data comprising:

a computer executing a computer program performing at least the following:

receiving into the computer a plurality of data points for clustering;

receiving into the computer a size parameter for specifying the number of data points to be moved at one time;

clustering the data points by using the size parameter to generate clustered results;

determining whether the clustered results are satisfactory;

when the clustered results are satisfactory, stop clustering;

otherwise when the clustered results are not satisfactory, revise the size parameter, perform clustering based on the revised size parameter and the clustered results, and proceed to determining whether the clustered results are satisfactory,

wherein clustering the data points further comprises:

evaluating subsets of data points in each cluster for moving into every other cluster by using a predetermined metric, wherein the number of data points in a subset is specified by the size parameter,

wherein evaluating subsets further comprises:

determining a geometric center of the subset of data points being evaluated for a move;

using the geometric center of the subset of data points and the predetermined metric to generate a value;

determining whether the value is greater than zero;

when the value is greater than zero, moving the subset of data points from a Move_From cluster to a Move_To cluster;

when the value is not greater than zero, determining if there are more subsets to evaluate;

when there are more subsets to evaluate, proceeding to evaluating the subsets;

when there are no more subsets to evaluate, determining whether any point has moved;

when a point has moved, proceeding to evaluating the subsets; and

when no point has moved, stopping the processing,

wherein each data point has a membership with one cluster; and

wherein moving the subset of data points from a Move_From cluster to a Move_To cluster further comprises simultaneously updating the membership of at least two data points from the membership of the Move_From cluster to the membership of the Move_To cluster.

26. (Previously presented) The system as defined in claim 24 wherein moving the subset of data points from a Move_From cluster to a Move_To cluster further comprises:

updating the count of the Move_From cluster;

updating the center of the Move_From cluster;

updating the count of the Move_To cluster;

updating the center of the Move_To cluster.

27. (Previously presented) The system as defined in claim 21 wherein revising the size parameter further comprises decreasing the size parameter.

28. (Cancelled).

29. (Currently amended) The system as defined in claim ~~22~~ 21 wherein the predetermined metric of the computer program comprises the following expression:

$$\frac{n_i}{n_i - |U|}|m_u - m_i|^2 - \frac{n_i}{n_j + |U|}|m_u - m_j|^2$$

where U is the subset of data points being evaluated for the move, $|U|$ is the size of U that is specified by the size parameter, m_u is the geometric center of U, m_I and m_j are the centers of the clusters and n_i and n_j are the counts of the clusters.

30. (Previously presented) The system as defined in claim 21 wherein the system is utilized in one of a data mining application, customer segmentation application, document categorization application, scientific data analysis application, data compression application, vector quantization application, and image processing application.

31. (Previously presented) The system as defined in claim 21 wherein determining whether the clustered results are satisfactory further comprises:
determining whether a change in a performance function is less than a predetermined value.

32. (Previously presented) The system as defined in claim 24, further comprising:
wherein each data point has a membership with one cluster; and
wherein moving the subset of data points from a Move_From cluster to a Move_To cluster further comprises simultaneously updating the membership of at least two data points from the membership of the Move_From cluster to the membership of the Move_To cluster.

33. (Currently Amended) A computer-implemented method for clustering data points, comprising:
receiving a plurality of data points in a computer system;
partitioning the plurality of data points into a plurality of clusters wherein each data point is a member of one cluster of the plurality of clusters;
evaluating a plurality of data points in a first cluster of the plurality of clusters ~~simultaneously~~ for moving into every other cluster of the plurality of clusters, wherein the number of data points evaluated is determined by a size parameter; ~~to determine whether the plurality of data points in the first cluster should be moved to a second cluster of the plurality of cluster;~~ and
moving the plurality of data points simultaneously from the first cluster to ~~the~~ a second

cluster if the determination is that the plurality of data points should be moved.

34. (Currently Amended) The computer-implemented method of claim 33, further comprising:

receiving ~~a~~ the size parameter that specifies a number of data points, wherein the plurality of data points in a first cluster comprises the number of data points specified by the size parameter.

35. (Cancelled)

36. (Currently Amended) The computer-implemented method of claim 34, wherein the predetermined metric comprises the following expression:

$$\frac{n_i}{n_i - |U|}|m_u - m_i|^2 - \frac{n_i}{n_j + |U|}|m_u - m_j|^2$$

wherein U is the plurality of data points being evaluated, $|U|$ is a size of U that is specified by the size parameter, m_u is a geometric center of U, m_I and m_j are geometric centers of the first cluster and the second cluster, and n_i and n_j are counts of the first cluster and the second cluster.

37. (Currently Amended) A system for clustering data points comprising:

a computer that stores a plurality of data points for clustering;

means for partitioning the plurality of data points into a plurality of clusters;

means for evaluating ~~whether~~ an aggregated move of ~~a subset of data points in a first cluster of the plurality of clusters to a second cluster of the plurality of clusters improves the partitioning~~ subsets of data points in a first cluster of the plurality of clusters for moving into every other cluster of the plurality of clusters, wherein the number of data points in each subset is determined by a size parameter; and

means for performing the aggregated move of the subset of data points to ~~the~~ a second cluster responsive to the results of the evaluation means.

38. (Cancelled)

39. (Currently Amended) The system of claim ~~38~~ 37, wherein the predetermined metric comprises the expression:

$$\frac{n_i}{n_i - |U|}\left|m_u - m_i\right|^2 - \frac{n_i}{n_j + |U|}\left|m_u - m_j\right|^2$$

wherein U is the subset of data points being evaluated, $|U|$ is a size of U that is specified by ~~a~~ the size parameter, m_u is a geometric center of U, m_I and m_j are geometric centers of the first cluster and the second cluster, and n_i and n_j are counts of the first cluster and the second cluster.

40. (Cancelled)

41. (Previously presented) The system of claim 37, wherein the means for evaluating includes means for generating a geometric center of the subset of data points based on a first plurality of data points in the first cluster and a second plurality of data points in the second cluster.

42. (Previously presented) The system of claim 37, wherein the means for performing an aggregated move includes means to simultaneously move the data points in the subset of data points from the first cluster to the second cluster.

43. (Previously presented) The system of claim 37, wherein the means for performing an aggregated move includes means to determine a geometric center of the first cluster and a geometric center of the second cluster after the subset of data points is moved, wherein a geometric center of the subset of data points is used in the determination.

44. (Previously presented) A computer-implemented method for clustering data points comprising:

receiving in a computer system a plurality of data points for clustering;

partitioning the plurality of data points into a plurality of clusters; and

repartitioning the plurality of data points among the plurality of clusters, wherein repartitioning comprises:

using a predetermined metric to evaluate subsets of data points in each cluster of the plurality of clusters for moving into every other cluster of the plurality of clusters, wherein the number of data points in each subset is determined by a size parameter; and

moving data points in a subset of data points simultaneously from a first cluster of the plurality of clusters to a second cluster of the plurality of clusters if the evaluation of the subset determines that the subset should be moved into the second cluster.

45. (Previously presented) The computer-implemented method of claim 44, further comprising

determining whether the repartitioning is satisfactory;

if the repartitioning is not satisfactory, performing:

changing the size parameter;

repartitioning the plurality of data points; and

determining whether the repartitioning is satisfactory

until the repartitioning is satisfactory.

46. (Previously presented) The computer-implemented method of claim 45, wherein determining whether the repartitioning is satisfactory comprises determining whether at least one data point was moved during the repartitioning.

47. (Previously presented) The computer-implemented method of claim 45, wherein determining whether the repartitioning is satisfactory comprises determining whether a change in a performance function is less than a predetermined value.

48. (Previously presented) The computer-implemented method of claim 44, wherein moving data points in a subset of data points simultaneously further comprises:
updating counts of the first cluster and the second cluster; and
recalculating geometric centers of the first cluster and the second cluster.

49. (Previously presented) The computer-implemented method of claim 44, wherein the predetermined metric is computed using at least the size parameter, geometric centers of the subset being evaluated, the first cluster, and the second cluster, and counts of the first cluster and the second cluster.

Reasons for Allowance

3. The following is an examiner's statement of reasons for allowance:

The prior art does not, either singly or on in combination, fairly teach or suggest the limitations of the clustering methods and systems as disclosed in independent claims 21, 25, 33, 37, and 44. Additionally, claims 23-24, 26-27, 29-32, 34-36, 38-43 and 45-49 are allowable because of their dependcy.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monplaisir G Hamilton whose telephone number is (703) 305-5116. The examiner can normally be reached on Monday - Friday (8:00 am - 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kim Y Vu can be reached on (703) 305-4393. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Monplaisir Hamilton

Note: TC 2100 will be moved to Carlyle in October, 2004, the new telephone number for TC 2100 receptionist is 571-272-2100, my new telephone number is (571) 272-3852 and my supervisor's new number is (571) 272-3859.

KIM VU
SUPERVISORY PATENT EXAMINER
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